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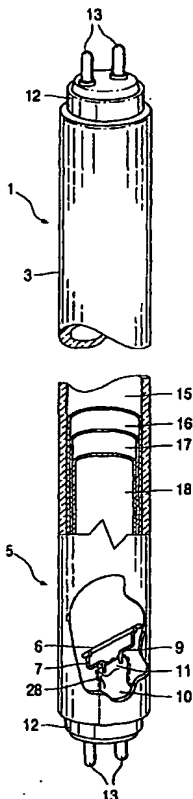
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(81) Designated States (national): AE, AG, AL, AM, AT, AU,
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LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC,
SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: LOW-PRESSURE MERCURY VAPOR DISCHARGE LAMP



(57) Abstract: A low-pressure mercury vapor discharge lamp (1) has a discharge vessel (3) enclosing, in a gastight manner, a discharge space provided with a filling of mercury and a rare gas. The discharge vessel (3) comprises means for maintaining an electric discharge in the discharge space. A portion of the surface (15) of the discharge vessel (3) facing the discharge space is provided with a protective layer (16) comprising yttrium oxide or aluminum oxide and further comprises a borate and/or a phosphate of an alkaline earth metal and/or of scandium, yttrium, or a further rare earth metal. Preferably, the alkaline earth metal is calcium, strontium, and/or barium. Preferably, the further rare earth metal is lanthanum, cerium, and/or gadolinium. The lamp according to the invention has a comparatively low mercury consumption.



(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Declaration under Rule 4.17:

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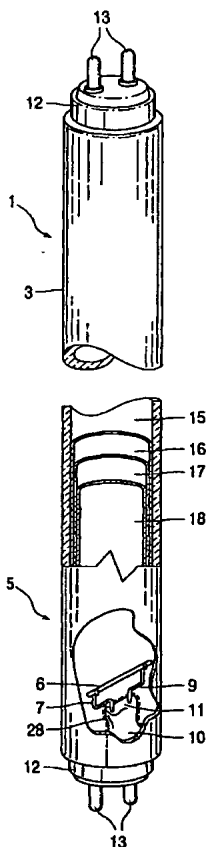
NL-5656 AA Eindhoven (NL). **STAATS**, Cornelia, T. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **GEERDINCK**, Leonie, M. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **DE BEER**, Esther [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). **SNIJKERS-HENDRICKX**, Ingrid, J., M. [BE/BE]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

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(57) Abstract: A low-pressure mercury vapor discharge lamp (1) has a discharge vessel (3) enclosing, in a gastight manner, a discharge space provided with a filling of mercury and a rare gas. The discharge vessel (3) comprises means for maintaining an electric discharge in the discharge space. A portion of the surface (15) of the discharge vessel (3) facing the discharge space is provided with a protective layer (16) comprising yttrium oxide or aluminum oxide and further comprises a borate and/or a phosphate of an alkaline earth metal and/or of scandium, yttrium, or a further rare earth metal. Preferably, the alkaline earth metal is calcium, strontium, and/or barium. Preferably, the further rare earth metal is lanthanum, cerium, and/or gadolinium. The lamp according to the invention has a comparatively low mercury consumption.

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TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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INTERNATIONAL SEARCH REPORT

Application No

PCT/IB 03/03129

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 H01J61/72 H01J61/35 H01J61/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 801 483 A (SAKAKIABRA YUICHI ET AL) 1 September 1998 (1998-09-01)	1,2,4-7, 11-13
Y	column 3, line 23 - line 52 column 5, line 40 - column 6, line 53; figure 7; table 1	9,10
X	WO 02/50871 A (KONINKL PHILIPS ELECTRONICS NV) 27 June 2002 (2002-06-27) abstract page 4, line 25 - page 5, line 17; figure 1	1,2,5,7, 8
Y	WO 01/056350 A (KONINKL PHILIPS ELECTRONICS NV) 9 August 2001 (2001-08-09) abstract page 6, line 22 - page 7, line 22; figures 1A,1B	9,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

*** Special categories of cited documents :**

"A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier document but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
 "&" document member of the same patent family

Date of the actual completion of the international search

27 November 2003

Date of mailing of the international search report

09.02.04

Name and mailing address of the ISA

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Authorized officer

Lang, T

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 03/03129

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1 (7th alternative); 2 and 5-13 when dependent thereon

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1 (first alternative); claims 2 and 4-13 when dependent thereon

A low-pressure mercury-vapor discharge lamp comprising a discharge vessel, the discharge vessel enclosing, in a gastight manner, a discharge space provided with a filling of mercury and a rare gas, the discharge vessel comprising means for maintaining a discharge in the discharge space, a portion of the surface of the discharge vessel facing the discharge space being provided with a protective layer, wherein

the protective layer comprises aluminium oxide and a borate of an alkaline earth metal.

2. claims: 1 (second alternative); claims 2-13 when dependent thereon

The protective layer comprises aluminium oxide and a borate of scandium, yttrium, or a further rare earth metal.

3. claims: 1 (third alternative); claims 2 and 4-13 when dependent thereon

The protective layer comprises aluminium oxide and a phosphate of an alkaline earth metal.

4. claims: 1 (fourth alternative); claims 2-13 when dependent thereon

The protective layer comprises aluminium oxide and a phosphate of scandium, yttrium, or a further rare earth metal.

5. claims: 1 (fifth alternative); claims 2 and 5-13 when dependent thereon

The protective layer comprises yttrium oxide and a borate of an alkaline earth metal.

6. claims: 1 (sixth alternative); claims 2-3 and 5-13 when dependent thereon

The protective layer comprises yttrium oxide and a borate of scandium, yttrium, or a further rare earth metal.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

7. claims: 1 (seventh alternative); claims 2 and 5-13 when
dependent thereon

The protective layer comprises yttrium oxide and a phosphate
of an alkaline earth metal.

8. claims: 1 (eighth alternative); claims 2-3 and 5-13 when
dependent thereon

The protective layer comprises yttrium oxide and a phosphate
of scandium, yttrium, or a further rare earth metal.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Application No

IB 03/03129

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5801483	A	01-09-1998	JP 9082284 A	28-03-1997
WO 0250871	A	27-06-2002	US 2002113554 A1	22-08-2002
			CN 1401131 T	05-03-2003
			EP 1346396 A1	24-09-2003
			WO 0250871 A1	27-06-2002
WO 0156350	A	09-08-2001	CN 1363113 T	07-08-2002
			WO 0156350 A2	09-08-2001
			EP 1188175 A2	20-03-2002
			JP 2003521804 T	15-07-2003
			US 2001026122 A1	04-10-2001